$$t=(PR/(S-.6P)$$

Where:

t = Minimum value for wall thickness;
P = Certified working pressure in psi;
S = ⅕ of the minimum specified tensile strength of the material in psi, or 10,000 psi if the tensile strength is unknown; and
R = Inside radius of the reservoir in inches.

(d) *Welded or riveted longitudinal lap seam main reservoirs.* (1) For welded or riveted longitudinal lap seam main reservoirs, an appropriate NDE method that can measure wall thickness of the reservoir shall be used instead of, or in addition to, the hammer test and hydrostatic test. The spacing of the sampling points for wall thickness shall not be greater than 12 inches longitudinally and circumferentially. Particular care shall be taken to measure along the longitudinal seam on both plates at an interval of no more than 6 inches longitudinally. The reservoir shall be withdrawn permanently from service where NDE testing reveals wall thickness less than the value determined by the following formula:

$$t=(PR/(0.5S-0.6P))$$

Where:

t = Minimum value for wall thickness;
P = Certified working pressure in psi;
S = ⅕ of the minimum specified tensile strength of the material in psi, or 10,000 psi if the tensile strength of steel is unknown; and
R = Inside radius of the reservoir in inches.

(2) Repairs of reservoirs with reduced wall thickness are prohibited.

§ 230.73 Air gauges.

(a) *Location.* Air gauges shall be so located that they may be conveniently read by the engineer from his or her usual position in the cab. No air gauge may be more than 3 psi in error.

(b) *Frequency of testing.* Air gauges shall be tested prior to reapplication following removal, as well as during the 92 service day inspection and whenever any irregularity is reported.

(c) *Method of testing.* Air gauges shall be tested using an accurate test gauge or dead weight tester designed for this purpose.

§ 230.74 Time of cleaning.

All valves in the air brake system, including related dirt collectors and filters, shall be cleaned and tested in accordance with accepted brake equipment manufacturer's specifications, or as often as conditions require to maintain them in a safe and suitable condition for service, but not less frequently than after 368 service days or during the second annual inspection, whichever occurs first.

§ 230.75 Stenciling dates of tests and cleaning.

The date of testing and cleaning and the initials of the shop or station at which the work is done, shall legibly be stenciled in a conspicuous place on the tested parts or placed on a card displayed under a transparent cover in the cab of the steam locomotive.

§ 230.76 Piston travel.

(a) *Minimum piston travel.* The minimum piston travel shall be sufficient to provide proper brake shoe clearance when the brakes are released.

(b) *Maximum piston travel.* The maximum piston travel when steam locomotive is standing shall be as follows:

Type of wheel brake	Maximum piston travel (in inches)
Cam Type Driving Wheel Brake	3½
Other forms of Driving Wheel Brake	6
Engine Truck Brake	8
Tender Brake	9

§ 230.77 Foundation brake gear.

(a) *Maintenance.* Foundation brake gear shall be maintained in a safe and suitable condition for service. Levers, rods, brake beams, hangers, and pins shall be of ample strength, and shall not be fouled in any way which will affect the proper operation of the brake. All pins shall be properly secured in place with cotter pine, split keys, or nuts. Brake shoes must be properly applied and kept approximately in line with the tread of the wheel.

(b) *Distance above the rails.* No part of the foundation brake gear of the steam locomotive or tender shall be less than 2½ inches above the rails.

§ 230.78 Leakage.

(a) *Main reservoirs and related piping.* Leakage from main reservoir and related piping shall be tested at every 92

service day inspection and shall not exceed an average of 3 psi per minute in a test of 3 minutes duration that is made after the pressure has been reduced to 60 percent of the maximum operating pressure.

(b) *Brake cylinders.* Leakage from brake cylinders shall be tested at every 92 service day inspection. With a full service application from maximum brake pipe pressure, and with communication to the brake cylinders closed, the brakes on the steam locomotive and tender must remain applied for a minimum of 5 minutes.

(c) *Brake pipes.* Steam locomotive brake pipe leakage shall be tested at the beginning of each day the locomotive is used, and shall not exceed 5 psi per minute.

§ 230.79 Train signal system.

Where utilized, the train signal system, or any other form of on-board communication, shall be tested and known to be in safe and suitable condition for service at the beginning of each day the locomotive is used.

CABS, WARNING SIGNALS, SANDERS AND LIGHTS

§ 230.80 Cabs.

(a) *General provisions.* Cabs shall be securely attached or braced and maintained in a safe and suitable condition for service. Cab windows of steam locomotives shall provide an undistorted view of the track and signals for the crew from their normal position in the cab. Cab floors shall be kept free of tripping or slipping hazards. The cab climate shall be maintained to provide an environment that does not unreasonably interfere with the engine crew's performance of their duties under ordinary conditions of service.

(b) *Steam pipes.* Steam pipes shall not be fastened to the cab. New construction or renewals made of iron or steel pipe greater than ⅛ inch NPS that are subject to boiler pressure in cabs shall have a minimum wall thickness equivalent to schedule 80 pipe, with properly rated valves and fittings. Live steam heating radiators must not be fastened to the cab. Exhaust steam radiators may be fastened to the cab.

(c) *Oil-burning steam locomotives.* If the cab is enclosed, oil burning steam locomotives that take air for combustion through the fire-door opening shall have a suitable conduit extending from the fire-door to the outside of the cab.

§ 230.81 Cab aprons.

(a) *General provisions.* Cab aprons shall be of proper length and width to ensure safety. Cab aprons shall be securely hinged, maintained in a safe and suitable condition for service, and roughened, or other provision made, to afford secure footing.

(b) *Width of apron.* The cab apron shall be of a sufficient width to prevent, when the drawbar is disconnected and the safety chains or the safety bars are taut, the apron from dropping between the steam locomotive and tender.

§ 230.82 Fire doors.

(a) *General provisions.* Each steam locomotive shall have a fire door which shall latch securely when closed and which shall be maintained in a safe and suitable condition for service. Fire doors on all oil-burning locomotives shall be latched securely with a pin or key.

(b) *Mechanically operated fire doors.* Mechanically operated fire doors shall be so constructed and maintained that they may be operated by pressure of the foot on a pedal, or other suitable appliance, located on the floor of the cab or tender at a suitable distance from the fire door, so that they may be conveniently operated by the person firing the steam locomotive.

(c) *Hand-operated doors.* Hand operated fire doors shall be so constructed and maintained that they may be conveniently operated by the person firing the steam locomotive.

§ 230.83 Cylinder cocks.

Each steam locomotive shall be equipped with cylinder cocks which can be operated from the cab of the steam locomotive. All cylinder cocks shall be maintained in a safe and suitable condition for service.